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**Date:** 27 September, 1991  
**To:** Ken Lucas, RPM, EPA Region IV  
**From:** Waynon Johnson, Coastal Resource Coordinator, Region IV  
**Subject:** Olin Corporation, McIntosh Plant, McIntosh, Washington County, Alabama

**Documents Reviewed:**

1. Woodward-Clyde Consultants. 1991. Revised Sampling and Analysis Plan, Macroinvertebrate Study and Fish Sampling. Remedial Investigation (RI)/Feasibility Study (FS), McIntosh Plant Site, Olin Corporation, McIntosh, Alabama.

**Background:**

The 600-hectare Olin Chemicals site is approximately 1.6 km southeast of McIntosh, Washington County, Alabama on the Tombigbee River. The site is largely undeveloped except for the 25-hectare main production area and is characterized by mixed hardwood-pine forest, swamp forest, and a 26-hectare lake with associated wetlands referred to as the Olin Basin. Olin Basin discharges to the Tombigbee River four to six months each year during periods of high rainfall. Surface water runoff flows south and east across the site, discharging to the river. A storm water collection system at the Olin plant also diverts runoff to the river. Two aquifers occur under the Olin site; the shallow, semi-confined alluvial aquifer and the confined artesian Miocene aquifer. Shallow groundwater at the site generally flows south and east, discharging to the Tombigbee River.

From 1952 to 1982, caustic soda and chlorine were manufactured on-site using a mercury-cell process. In 1954, additional facilities were constructed to make "crop protection chemicals," initially producing pentachloronitrobenzene (PCNB), and later trichloroacetonitrile (TCAN) and 5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole (terrazole). This facility was closed in late 1982. In 1978, Olin constructed a diaphragm-cell caustic soda/chlorine plant which continues to operate today to manufacturing caustic soda, chlorine, sodium hypochlorite, and sodium chloride. Hydrazine is blended on-site for rocket fuel formulations.



**Revised Field Sampling Plan:**

The currently proposed field study is designed to:

- Determine the nature and extent of contaminants in selected organisms residing in Olin Basin,
- Expand and refine the baseline risk assessment for human health, and
- Support the development of an ecological assessment.

Several studies of the basin outlined in the original sampling plan have been completed, including the bathymetry survey, sediment sampling and the fisheries reconnaissance survey. Based on these results, the macroinvertebrate and fish bioaccumulation study plan was revised as follows:

- An Eckman grab will be used to collect triplicate benthic invertebrate samples at 20 stations in the deeper portions of the basin and in the lower end of the plant effluent channel,
- Twenty individual fish from each of two species, largemouth bass and yellow or black bullheads, will be collected from the main basin primarily using electroshock fishing techniques. Channel catfish, common carp, and freshwater drum will be used as alternate species if less than 20 bullheads are collected,
- Fish community studies will not be conducted along the shallow margins of the lake because of the lack of habitat (very little herbaceous, emergent aquatic vegetation present).

Benthic invertebrate community samples will be collected using a 0.02 square meter Eckman grab. Samples will be screened in the field through a 250  $\mu$ m mesh (Number 60) screen to separate the biota from the sediments and will be preserved in a solution of 5 percent formalin. Samples will be rescreened in the laboratory using the same mesh size to remove the specimens from the formalin prior to processing. Biological stains will be used to facilitate sorting. Organisms will be separated into major taxa groups (amphipods, insect orders, and oligochaetes) and counted. The first 200 organisms sorted from each sample will be identified to the lowest practical taxonomic level.

A total of 40 fish will be collected from the Olin Basin representing two trophic levels, a top predator and a bottom-feeding species. Each specimen will be dissected to remove fillets for analyses of mercury and selected organic compounds. Target analytes are yet to be selected and will be presented in a later document. The remaining body carcasses (offal) will be analyzed separately and the resulting data will be combined with the fillet data to

estimate whole body concentrations. All samples will be held on ice prior to dissection and analysis.

#### **Review of Field Sampling Plan:**

As stated in an earlier review, the objectives of the sampling plan need to be expanded to fully evaluate the threat to natural resources. Because the Olin Basin is contiguous with the Tombigbee River for four to six months each year and groundwater from the site discharges to the river, it is important to include the adjacent reach of the Tombigbee River in the scope of this RI/FS investigation. At a minimum, fish species comparable to the on-site study should be collected from the Tombigbee River adjacent to the basin for analyses of mercury and selected organic compounds.

Within the scope of the bioaccumulation study, several procedural points were unclear. Although fish weight and length will be measured, it is important that within each species, individuals of the same size class and age are selected for analyses to minimize variation in data to determine bioaccumulation potential. In addition, lipids should be measured for each sample as part of the chemical analyses. The variability of chemical concentrations in tissues can be more clearly interpreted if the fat content of the tissues is known. If fillets, carcasses or other tissue are analyzed separately, lipids measurements are needed for each subsample.

Methods other than electroshocking may be needed to capture bottom-dwelling species (e.g., bullheads or channel catfish) because many of these fishes may not float to the surface when shocked. Also, fish community composition data should be collected during sampling events. Because most sampling techniques are not species-specific, community information should be easy to collect. All fish captured should be identified and counted prior to discarding of non-target species.

It was unclear in the revised sampling plan as to how benthic invertebrate samples will be processed and analyzed. Three grab samples will be taken in the field but it appears they will be treated as one sample. Using this approach, only qualitative evaluations of the benthic community can be made (e.g., species presence/absence, relative abundance). Since individual grab samples will be collected, each sample should be processed independently. Separate, replicate values will permit estimates of average community parameters (e.g., richness, abundance, diversity) and the associated variability to be made for each station. Statistical analyses can then be performed to identify differences in community structure within the basin. Calculated community indices also may be used to correlate contaminant levels with effects (e.g., changes in abundance, numbers to taxa, etc).

Although triplicate grab samples of benthic community samples will allow an estimate of community variability, five or more samples are more commonly taken in freshwater invertebrate community studies. It is recommended that the number of grab samples taken

at each station be increased to five replicate samples to provide a more accurate estimate of community variability.

It was briefly mentioned in the original sampling plan that macroinvertebrate community structure (as measured by richness, abundance, and diversity) at each station would be compared to control stations. Under the revised plan, comparisons will be made based on contaminant gradients rather than comparison between contaminated and control sites. It is important that control stations be sampled and that they be representative of habitat types found in the Olin Basin.

During benthic invertebrate sample processing, samples should be rescreened using a mesh size at least one size smaller (i.e., Number 70 or 80 screen) than that used in the field to prevent loss of organisms. In addition, it was unclear in the revised plan how processing will actually take place. If all organisms are sorted to major taxonomic categories and counted, how will the "first" 200 organisms be selected for full taxonomic identification? If samples are to be split prior to counting and identifying, this needs to be presented in the plan. If only subsamples are processed, each subsample should represent a proportional split. Subsamples should be processed in their entirety and should include at least 200 organisms. If one subsample does not have 200 organisms, equivalent portions of the sample should be processed until 200 organisms are counted.

It is unfortunate that the biological sampling will not be conducted at the same time as sediment sampling because synoptic data would provide the greatest ability to interpret changes in benthic communities and potential effects. Because biological and chemical samples will be asynchronous, it is recommended that a few sediment samples be collected during the biological sampling to verify that chemistry data from the earlier survey are still representative of conditions occurring during the biological sampling.

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## **MEMORANDUM**

**DATE:** January 25, 1991  
**TO:** Cheryl W. Smith, RPM, South Superfund Remedial Branch  
**FROM:** John A. Lindsay, Coastal Resource Coordinator  
**SUBJECT:** Olin McIntosh Plant Site; RI/FS Draft Work Plan and Field Sampling and Analysis Plan

### **Tombigbee River Potential Contamination:**

Because contaminated groundwater and surface waters from the Olin Basin discharge to the Tombigbee River (at least during part of the year), and biological resources may wander into and out of the basin, some evaluation of the potential to contaminant resources in the Tombigbee River should be included in the scope of this RI/FS investigation. The Tombigbee River aspect could be approached through an application of ecological risk modeling (see below). Such an effort would compliment similar investigations of mercury contamination in the Mobile River downstream of this site.

### **Sediment Analyses (§3.2.2.2 pg 21):**

It was proposed that surface sediments would be stored until the analyses of sediment cores were completed. Holding times should be recommended to minimize problems of data interpretation associated with the loss of organic mercury.

### **Detection Limits:**

No detection limits for analytes in surface water or sediments were presented in the workplan. It is important that detection limits be as low as possible so that the resulting data will be meaningful for toxicity evaluations.

### **Macro-invertebrate Sampling (§4.1.7 and § 6.7):**

The timing of this sampling is unclear and it should be clarified, but I interpret it to begin following the bathymetry survey and sediment contaminant analyses. Regardless, sampling locations need review by the peer group prior to implementation. Also, this effort should be part of a comprehensive biota survey (see fish survey below).

(§4.1.7):

The study should also include a discussion of abundances and taxonomic composition. The comparisons should be made not only to control samples (see below), but also to expected abundances and composition in general for this habitat and environment.

#### **Composite Samples (§6.7.2):**

Quantitative data are needed to determine actual impacts to macro-invertebrate populations in Olin Basin. Compositing benthic community samples at each station will only provide a semi-quantitative assessment of community structure. Individual grab samples from each station should be processed separately, and therefore **not composited**, to provide an estimate of the variability in the community and to allow statistical tests of differences among stations in the basin. In addition, it is recommended that the number of grab samples taken at each station be increased to a minimum of five replicate grab samples to provide a more accurate estimate of community variability. A description of sediment composition should be made during sampling and noted. Samples for each station should all be consistent with regards to sediment composition.

#### **Control Stations (§4.1.7):**

It was briefly mentioned that macro-invertebrate community structure (as measured by richness and diversity) at each station would be compared to control stations. No information was provided on where the controls would be located. It is important that several control stations be sampled and that they are representative of habitat and sediment types found in Olin Basin.

#### **Fish Survey (§4.1.9):**

First, the fish survey should be part of the RI proper and part of an overall biota survey which includes macroinvertebrates, and wetlands delineation. While the information appears intended as part of a human health risk assessment, it should not be construed that fish health is limited to human concerns as suggested on page 60. Ecological risk is an important consideration at this site.

#### **Ecological Risk Modelling:**

An ecological risk model should be added to the investigation in Phase II. The model should consider soils and sediments as sources, potential surface water transport, tissue uptake and accumulation by direct ingestion or exposure to dissolved phases, transfer between major food web compartments, chemical transformation between organic and inorganic forms of mercury, and net export of mercury to the Tombigbee River.

#### **Addition of A Phase III:**

An additional phase should be added to this investigation. Elements of this phase include tissue analysis and additional sediment analyses.

A. Tissue Analyses. The emphasis placed on the fish survey in §4.1.9 should be realigned to include examination of biological tissues (a food web survey) in general. The timing of this food web survey should be following Phase I and Phase II efforts. Tissue Analyses, should be added to verify the results of the ecological risk model. The Tombigbee River should be included in this survey.

Potential tissue analyses should consider species from several trophic levels (not just fish). Species might include representatives from detritivores, secondary consumers and top

carnivores. During efforts to collect fish for contaminant analysis, a qualitative description should be made to provide a picture of the fish community residing in the Olin Basin. We recognize that the information of greatest value will come from fishes

"indigenous" to Olin Basin. But the relative health of the basin can only be determined from an adequate description of the community in the basin by way of comparisons to expected community and population structure and abundance. Gear and collection methods should be selected to allow all trophic levels of the fish communities to be sampled.

B. Sediment Analyses. Additional sediment samples should be taken to reveal the vertical distribution of contaminants in sediments that are most highly contaminated as observed in Phase 1, or most critical for receptor exposure. Discrete samples at 1 cm intervals through the bioaccessible zones is necessary to provide information on sedimentation or erosion for consideration of possible remedial alternatives.

#### **Ecological Risk Assessment:**

A comprehensive ecological risk assessment needs to be performed at this site.